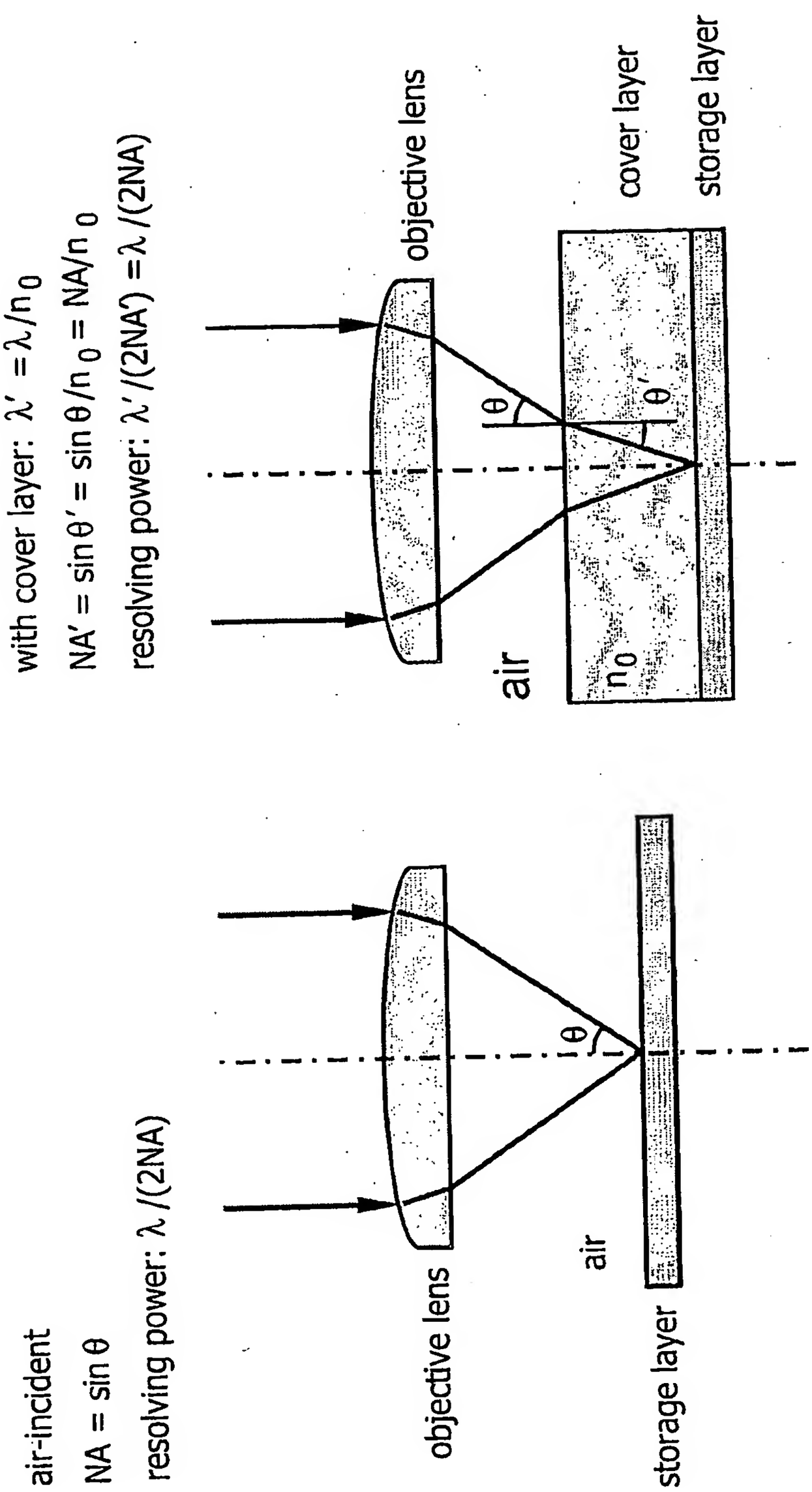

air-incident
NA = sin θ
resolving power: λ /(2NA)
objective lens
air
storage layer
with cover layer: λ' = λ/n0
NA' = sin θ'/n0 = NA/n0
resolving power: λ' /(2NA') = λ /(2NA)
objective lens
cover layer
storage layer
air
n0

FIG.1A

FIG.1B

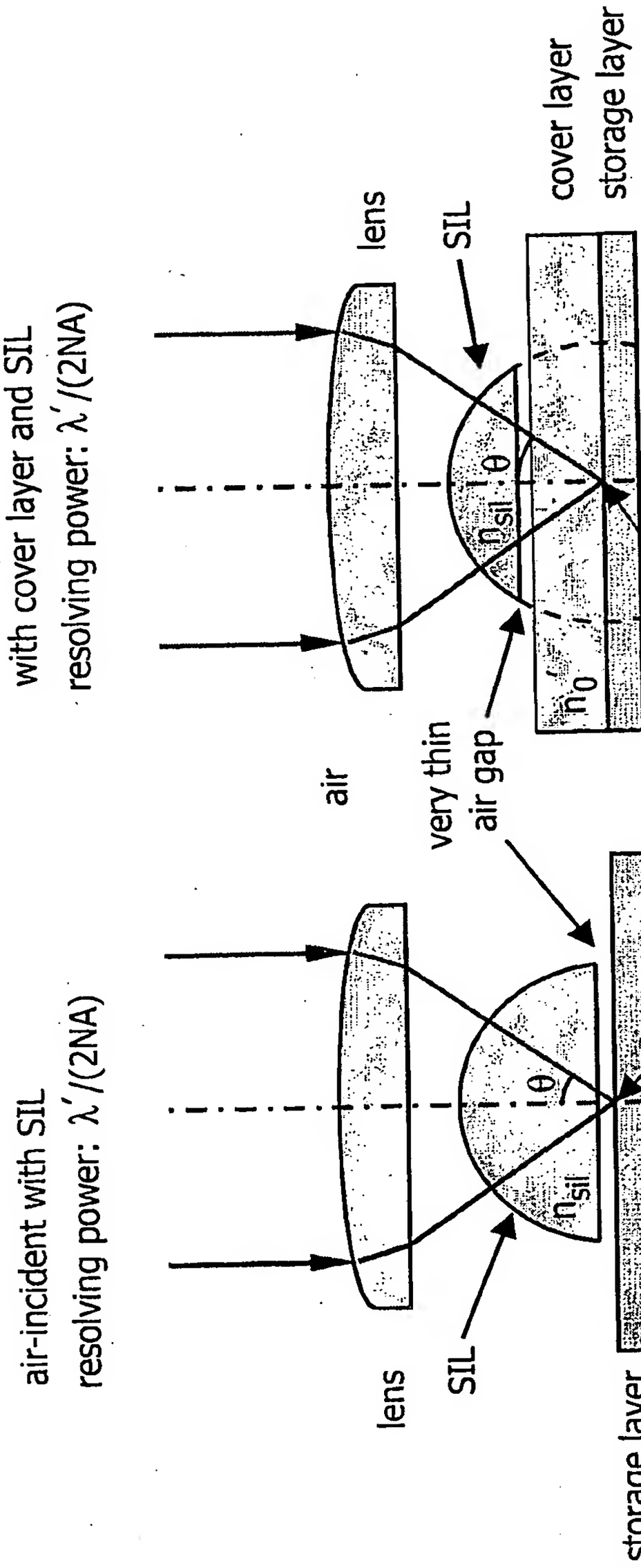

air-incident with SIL
resolving power: λ′/(2NA)
lens
SIL
storage layer
θ
n_{sil}
air
very thin
air gap
centre of sphere
with cover layer and SIL
resolving power: λ′/(2NA)
cover layer
storage layer
n_0

FIG.2A

FIG.2B

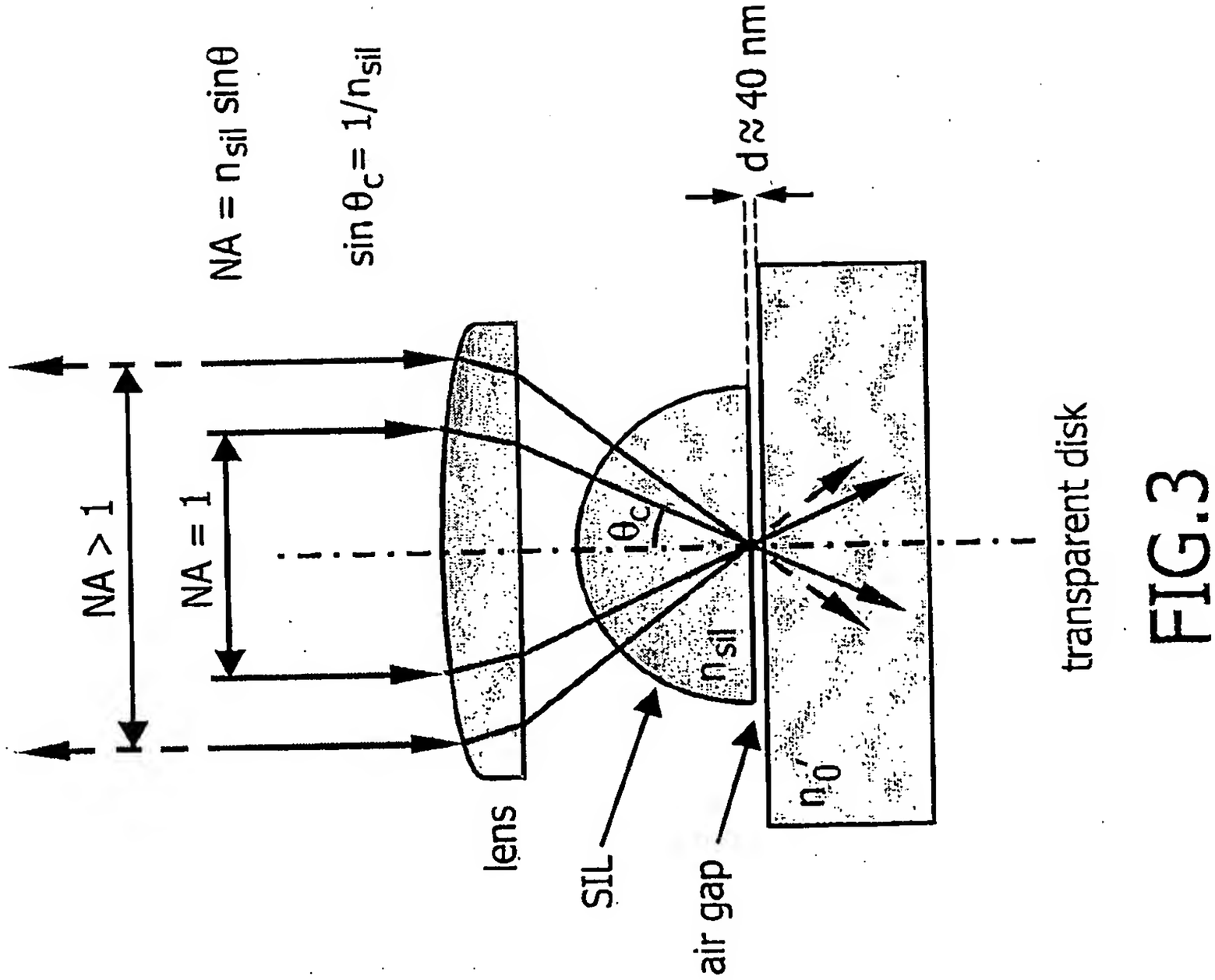

NA = n_{sil} sinθ
$\sin\theta_c = 1/n_{sil}$
d ≈ 40 n
NA > 1
NA = 1
θ_c
n_{sil}
n_0
lens
SIL
gap
air
transparent disk

FIG.3

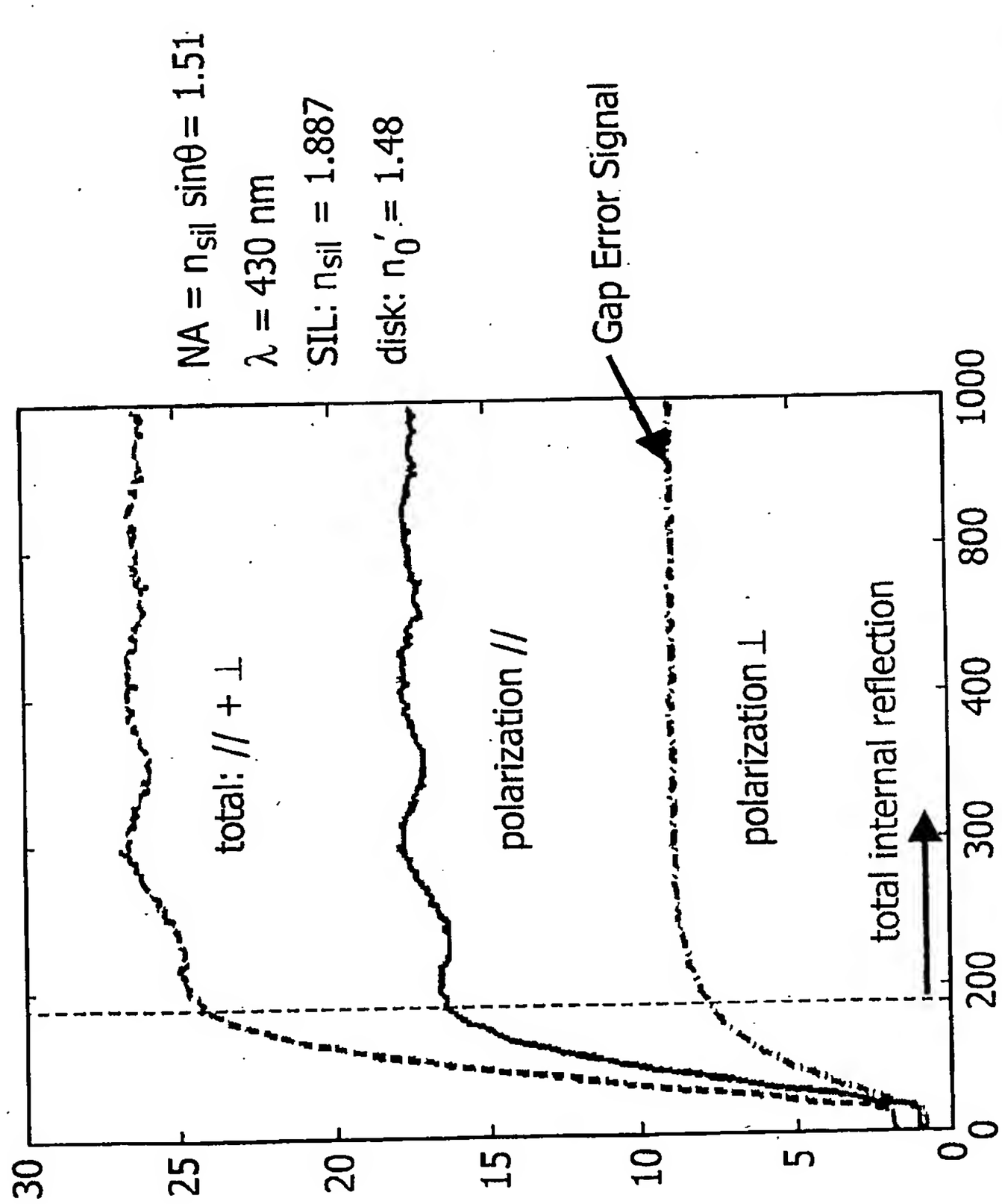

NA = n_{sil} sinθ = 1.
λ = 430 nm
SIL: n_{sil} = 1.887
disk: n_0' = 1.48
total: // + ⊥
polarization //
Gap Error Signal
polarization ⊥
total internal reflection
Air gap (nm)
0
200
300
400
800
1000
5
10
15
20
25
30
Reflected intensity (arb. units)

FIG. 4

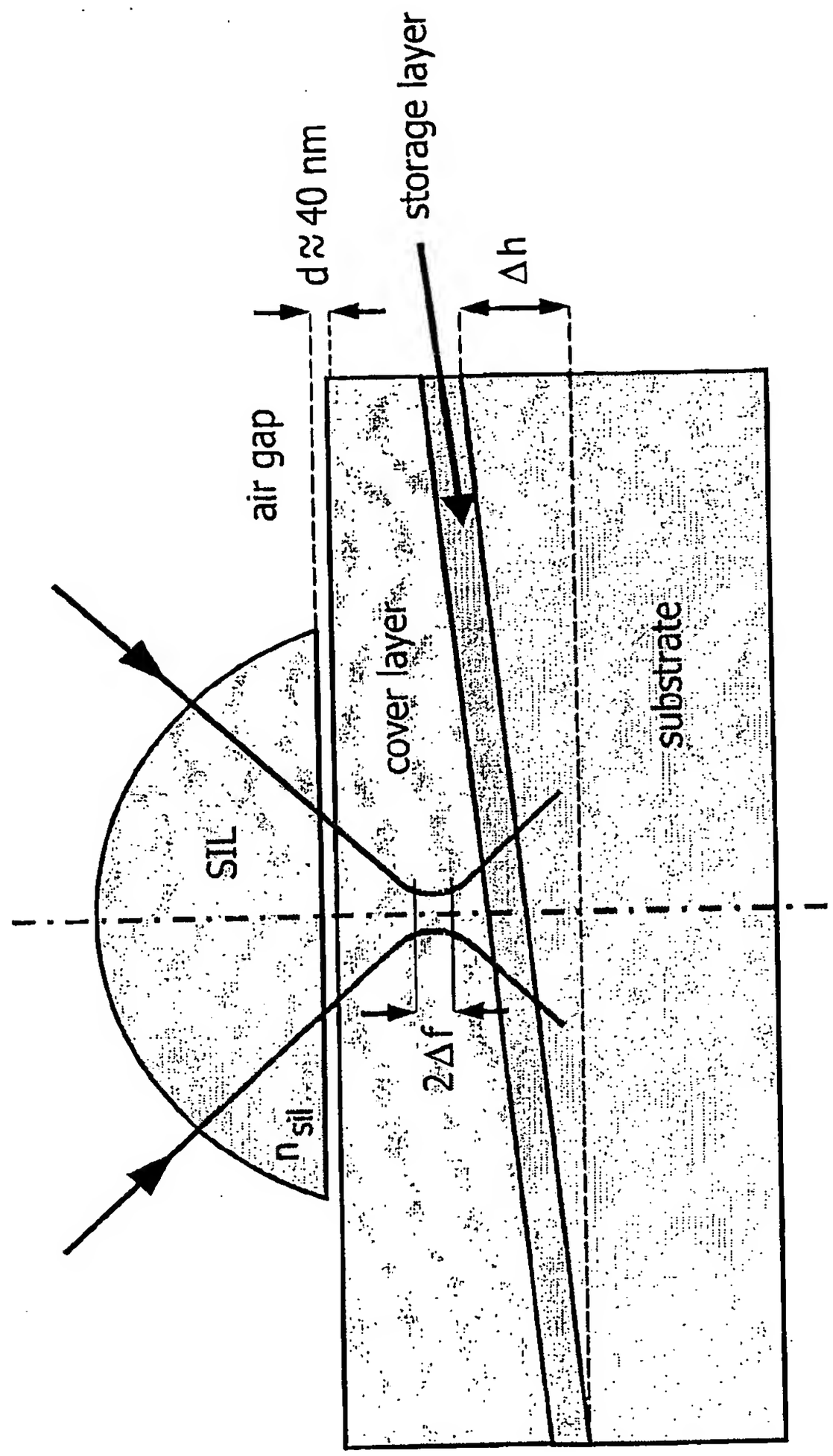

air gap
d≈40 nm
storage layer
Δh
SIL
cover layer
substrate
n_{sil}
2Δf

FIG.5

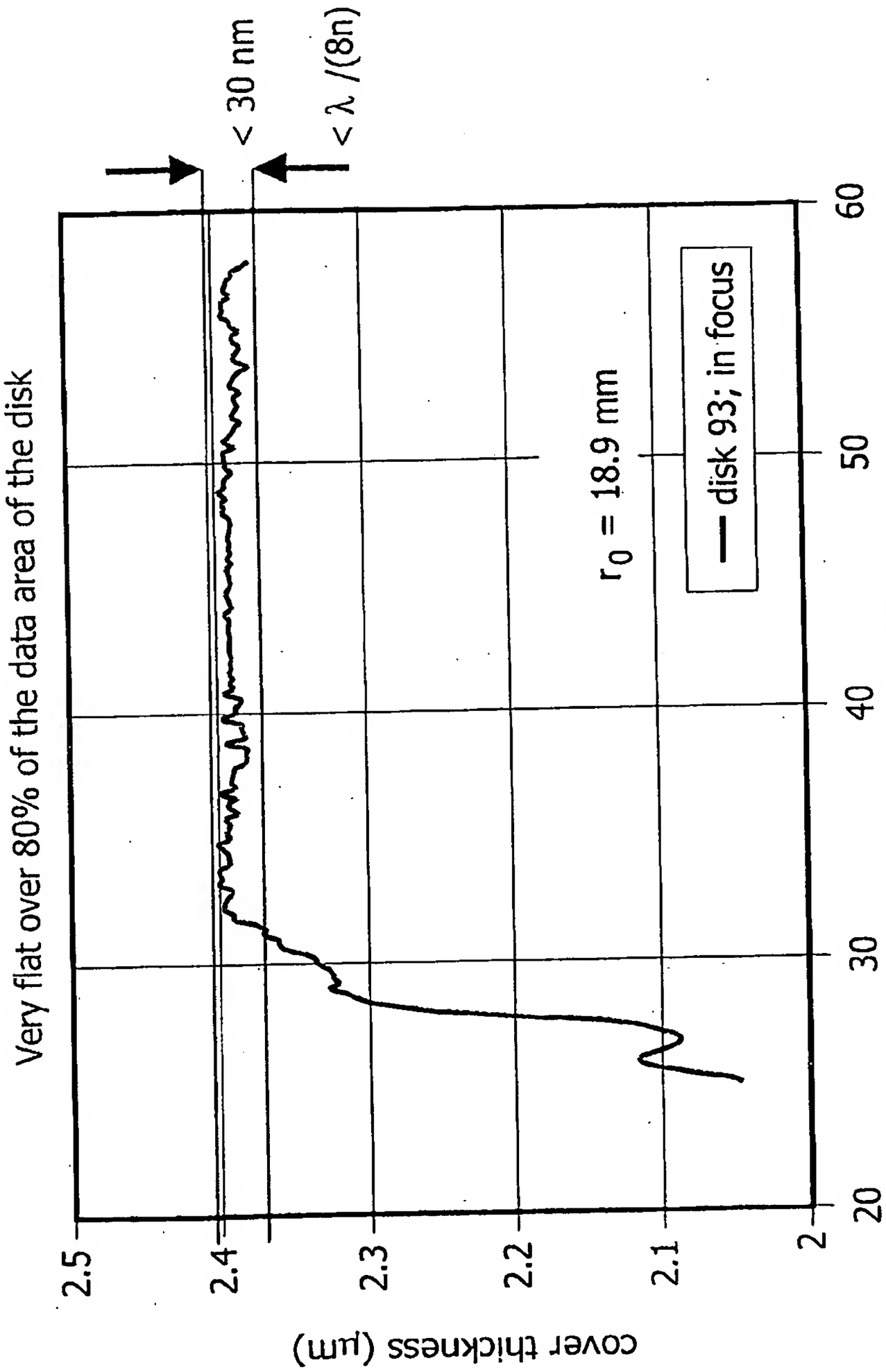

< 30 nm
< λ /(8n)
Very flat over 80% of the data area of the disk
r0 = 18.9 mm
— disk 93; in focus
60
50
40
30
20
disc radius (mm)
2.5
2.4
2.3
2.2
2.1
2
cover thickness (μm)

FIG.6

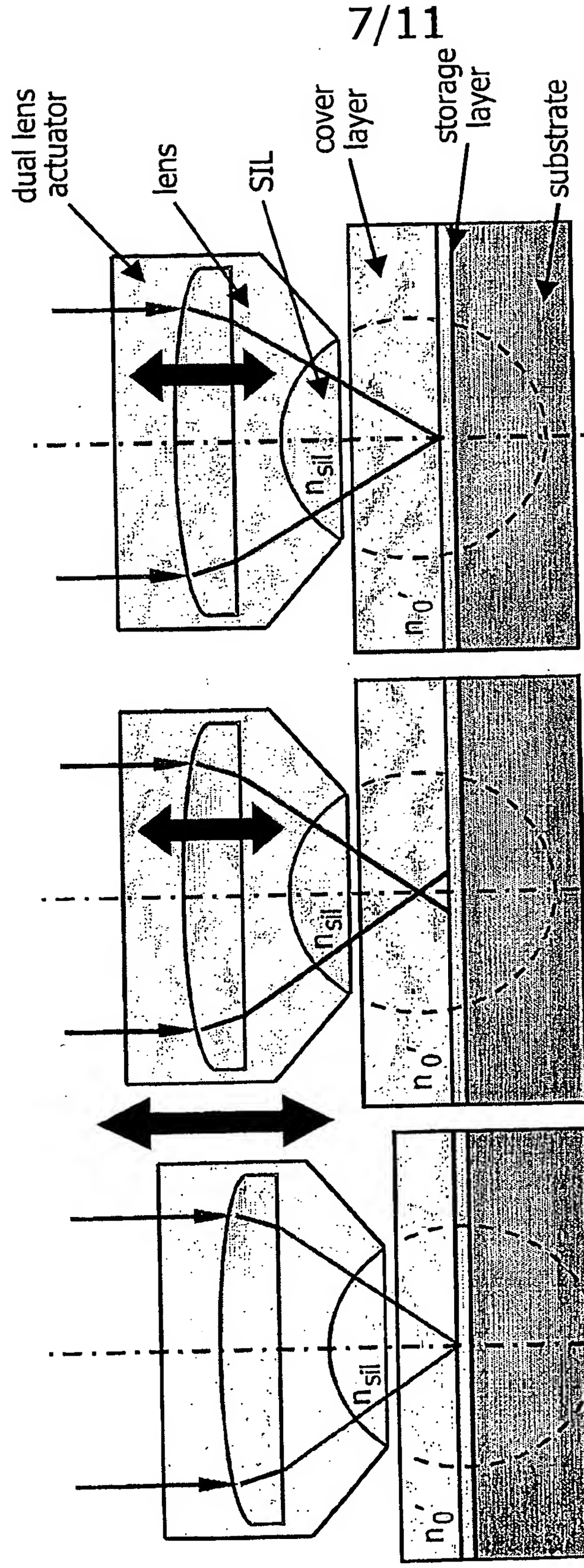
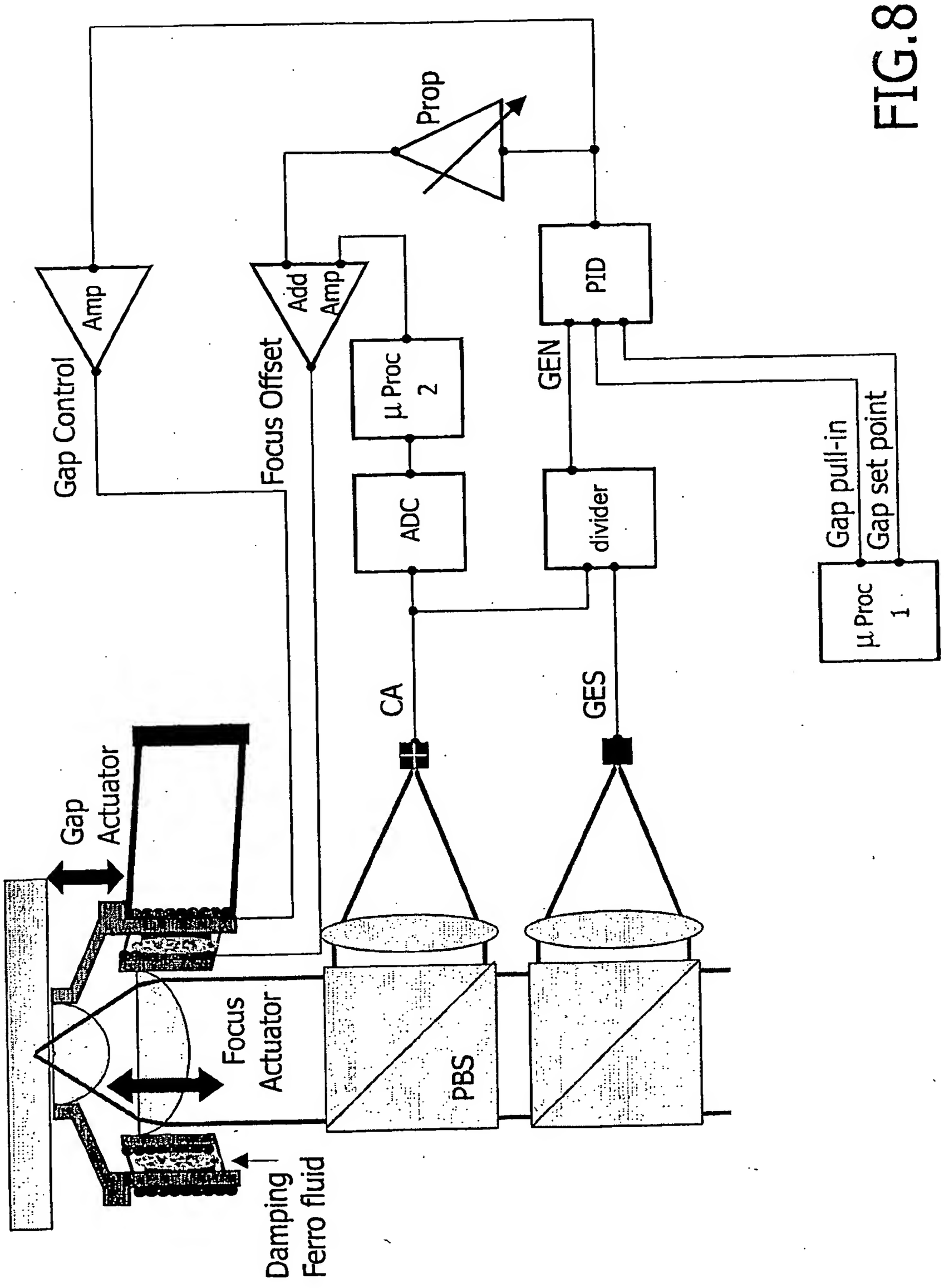


FIG.7C

FIG.7B

FIG.7A

FIG.8


Prop
Amp
Gap Control
Add
Amp
Focus Offset
µ Proc
2
ADC
CA
PID
GEN
divider
GES
Gap pull-in
Gap set point
µ Proc
1
Gap
Actuator
Focus
Actuator
PBS
Damping
Ferro fluid

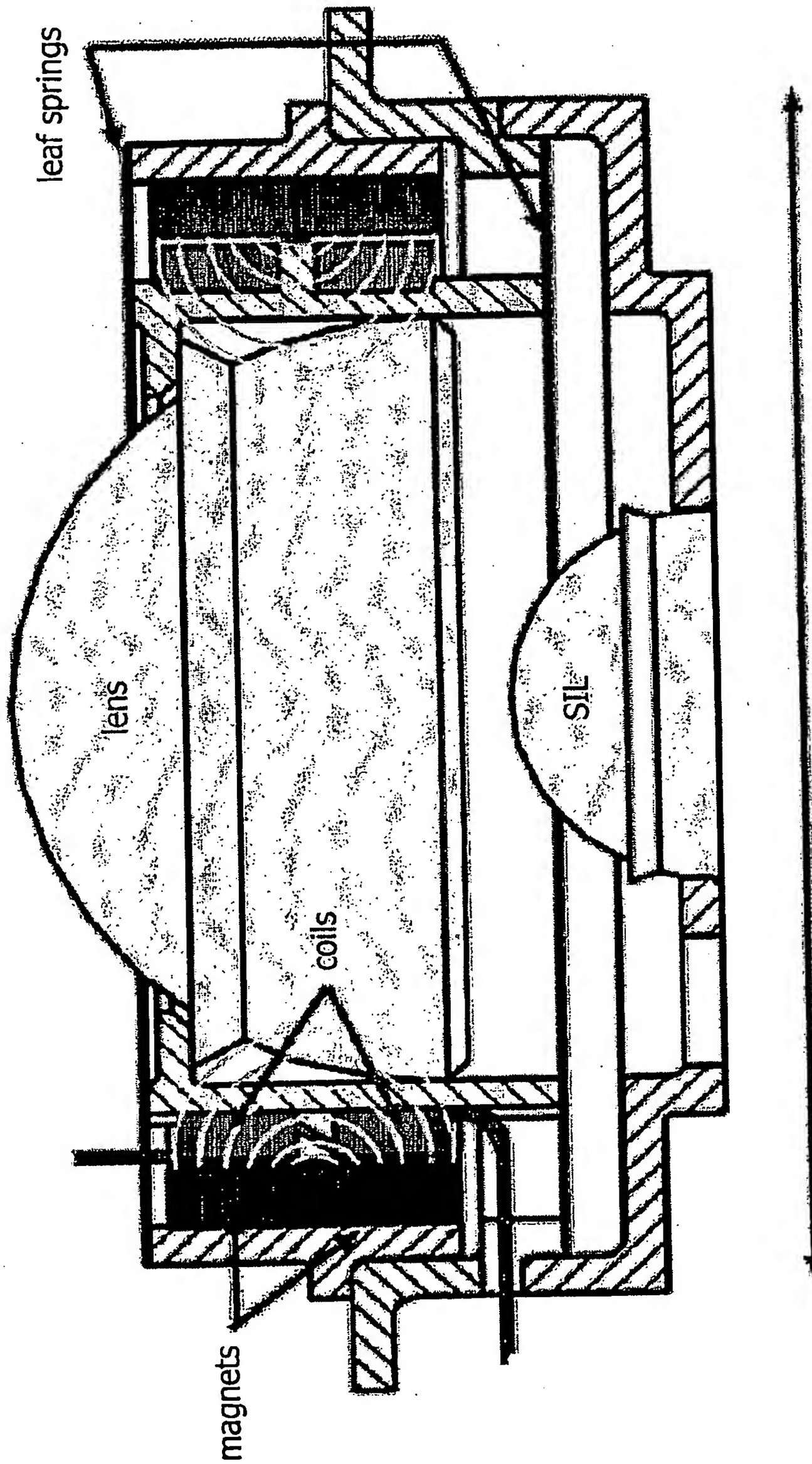


FIG.9

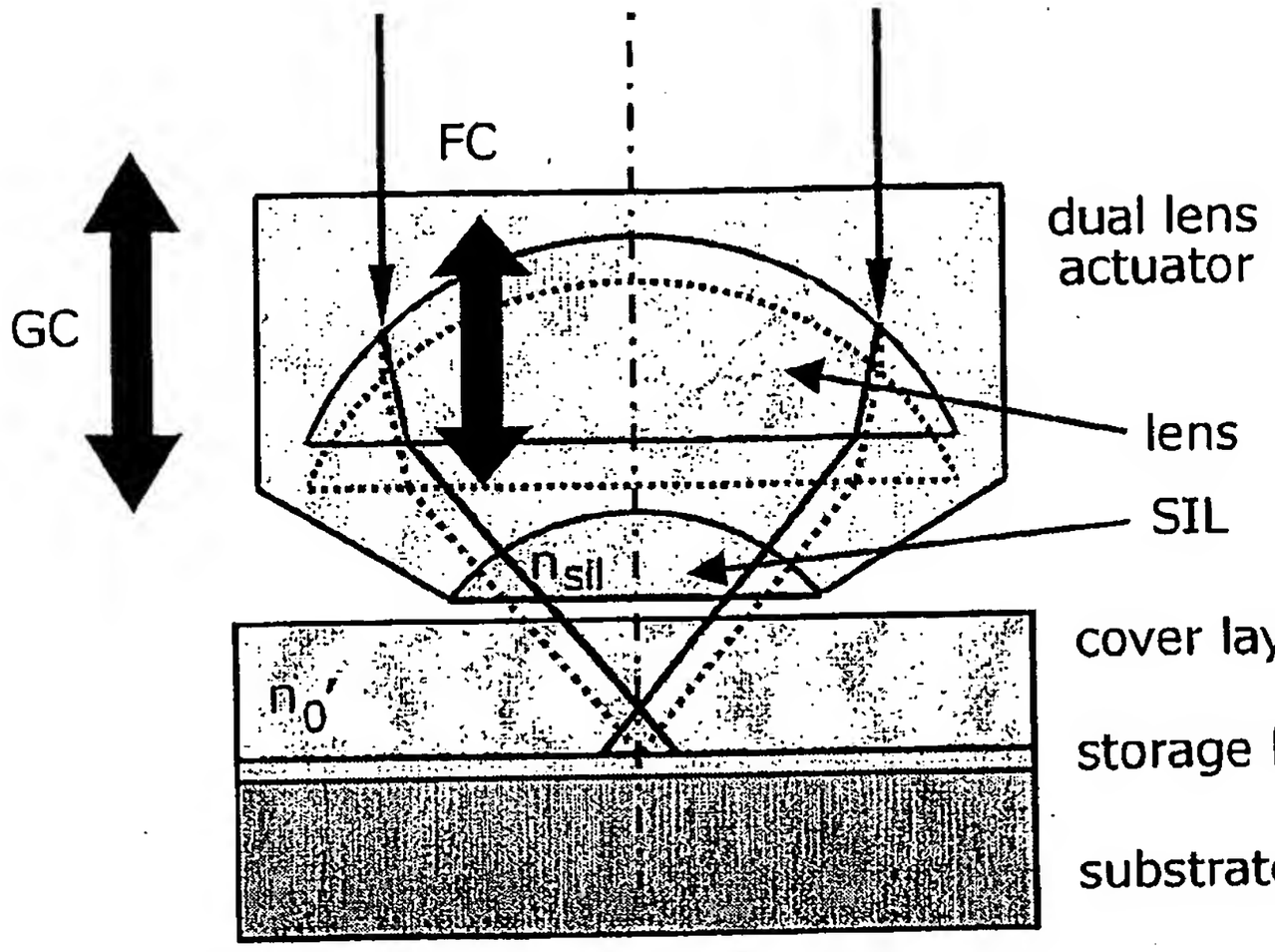

FC
GC
dual lens actuator
lens
SIL
n_{sil}
n_0'
cover layer
storage layer
substrate

FIG.10

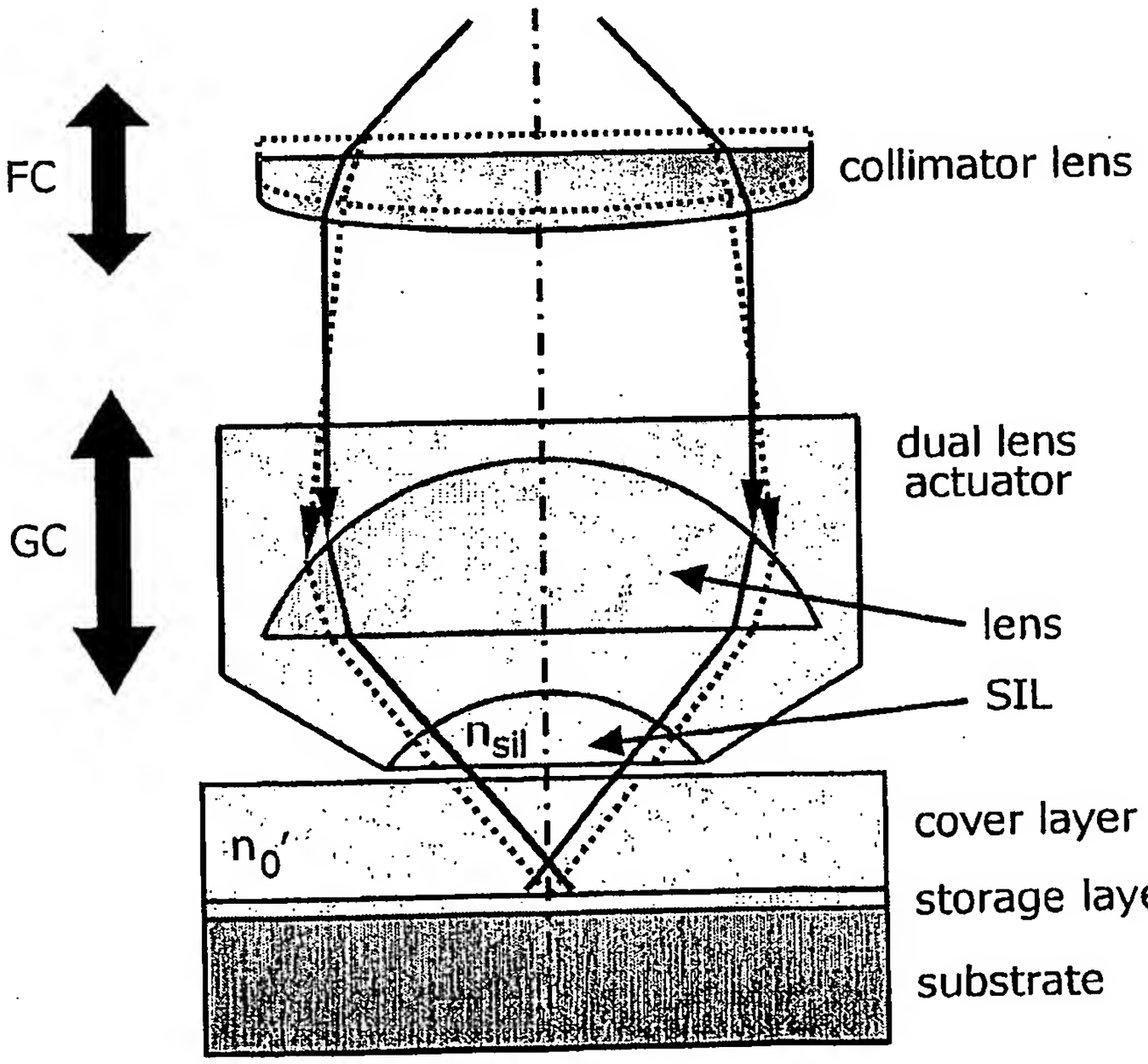

FC
GC
collimator lens
dual lens actuator
lens
SIL
n_{sil}
n_0'
cover layer
storage layer
substrate

FIG.11

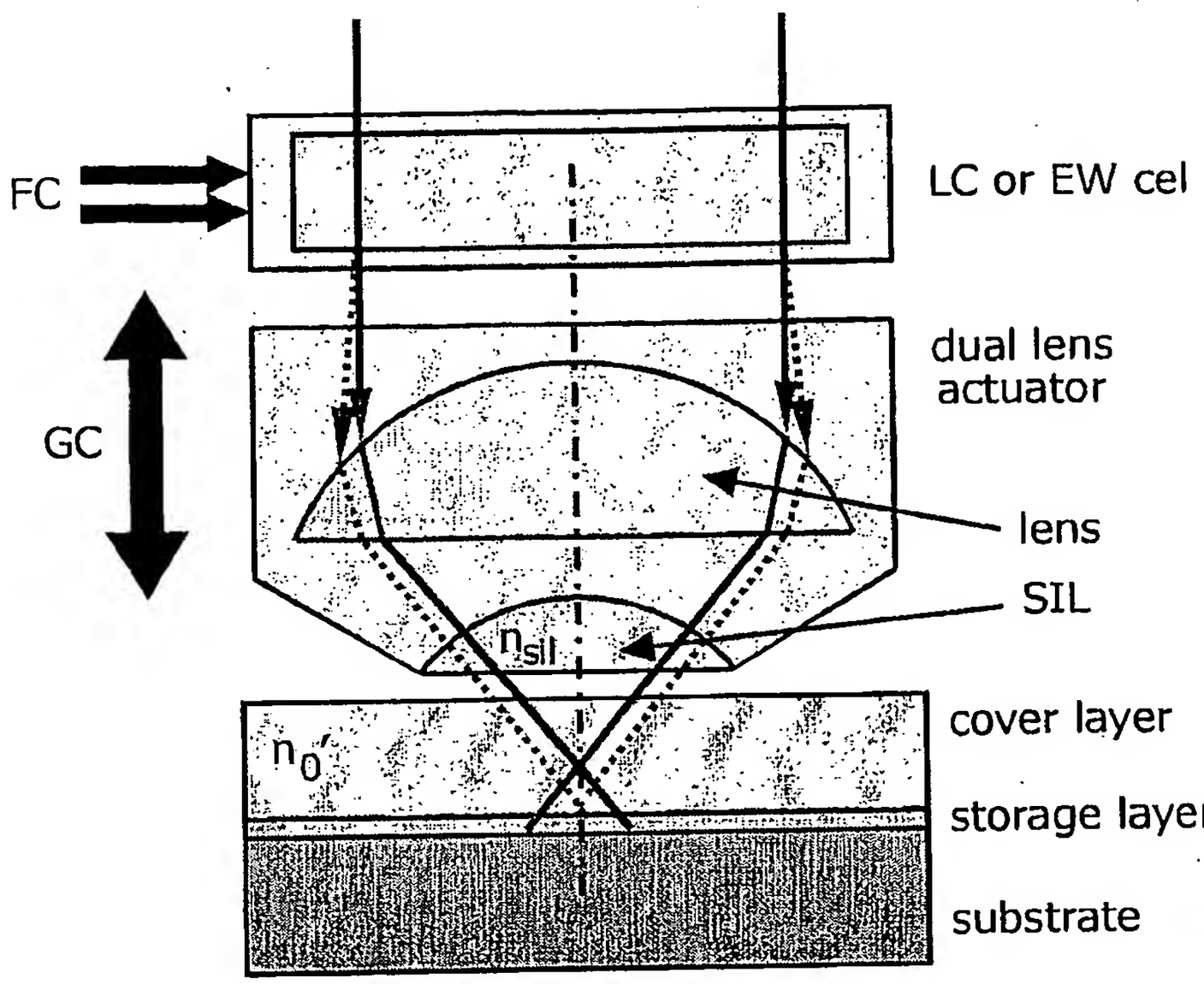

FC
GC
LC or EW cel
dual lens actuator
lens
SIL
n_{sil}
n_0'
cover layer
storage layer
substrate

FIG.12

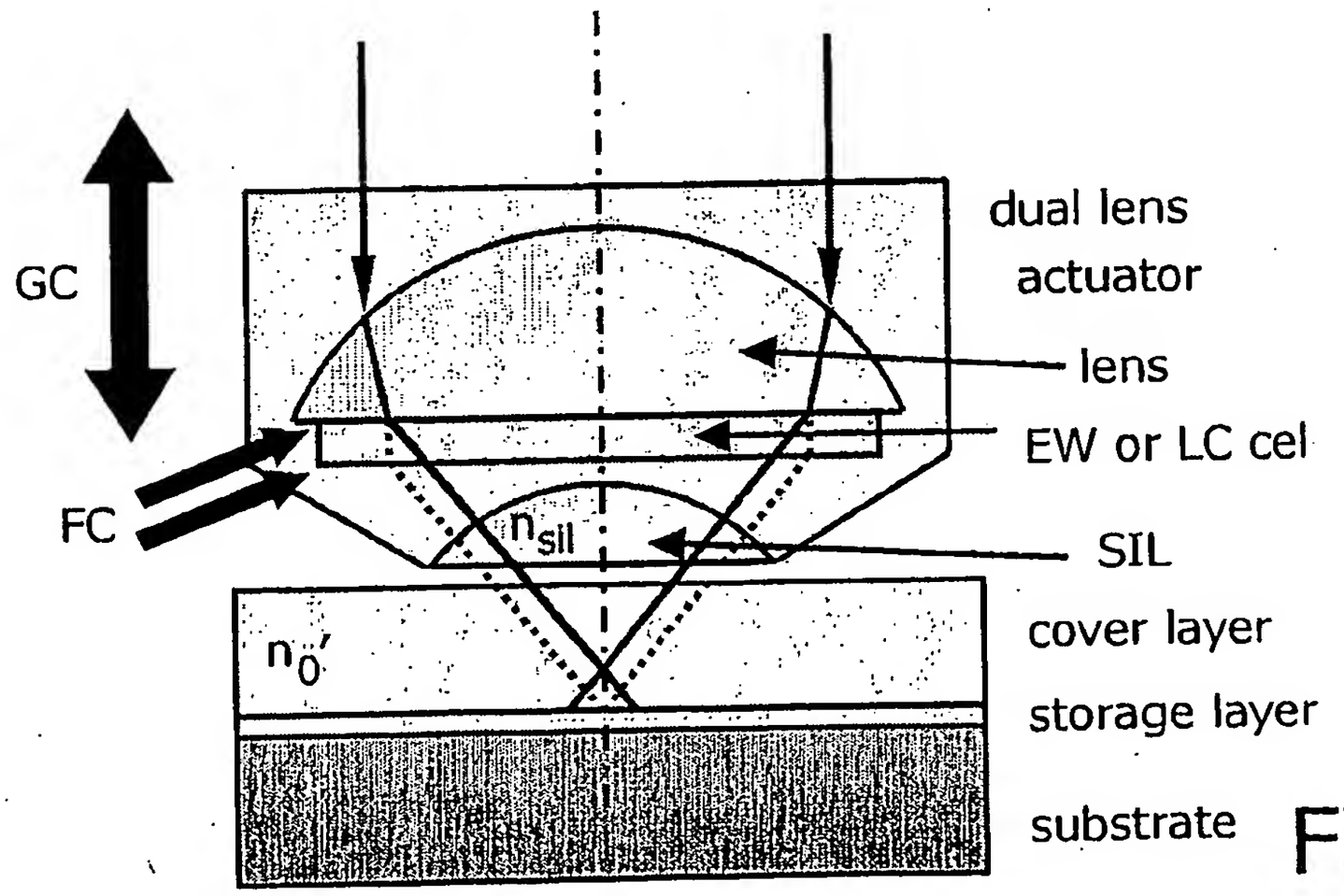

GC
FC
dual lens actuator
lens
EW or LC cel
SIL
n_{sil}
n_0'
cover layer
storage layer
substrate

FIG.13